(19) JAPANESE PATENT OFFICE (JP)

(12) Patent Disclosure Bulletin (A)

(11) Disclosure Number: H7-24577

(43) Disclosure Date: January 27, 1995

(51) Int. Cl.[6]	ID Symbol	Internal Admin. No.	F1	Technical Display Points
B 23 K 9/23	K	8315-4E		
9/028	B	7011-4E		
9/04	H	8315-4E		
31/00	B			

Examination Requested Not yet Number of Claims: 1 (Total 3 pages)

(21) Application Number H5-172769

(22) Application Date July 13, 1993

(71) Applicant 000001052
Kubota Corp
1-2-47 Shikitsu-higashi, Naniwa-ku, Osaka

(72) Inventor TORIGOE, Takeshi
c/o Kubota Hirakata Plant, 1-1-1 Nakamiya Ooike, Hirakata-shi, Osaka

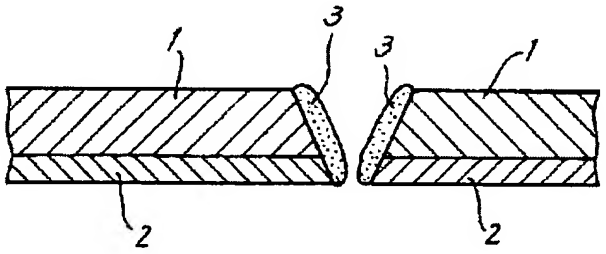
(74) Agent MARUYAMA, Toshiyuki
Attorney (and 1 other)

(54) TITLE OF INVENTION
Butt Welding Method for Clad Tubes

(57) ABSTRACT

PURPOSE
To obviate tempering treatment after welding when clad tubes whose outer layer (1) is formed of carbon steel or low alloy steel and inner layer (2) is formed of stainless steel or high alloy steel, are butt welded at a construction site.

CONSTITUTION
Before butt welding at a construction site, cladding by welding using a stainless steel or high alloy steel electrode is performed on at least the end faces of the outer layers to form a cladded region (3) and a tempering treatment is carried out on the base metal outer layer region which was heat-affected and hardened by welding. At the construction site, the cladded region 3 of stainless steel or high alloy steel are abutted to each other and welded.



Scope of Patent Claims

Claim 1
A clad tube butt welding method for butt welding at a construction site clad tubes which are formed from an outer layer of carbon steel or low alloy steel and an inner layer of stainless steel or high alloy steel, comprising weld cladding at least the outer layer end face using a stainless steel or high alloy steel welding electrode to form a cladded region, temper treating the base material outer layer which was heat affected and hardened by welding, and then at a construction site, butt welding the stainless steel or high alloy steel cladded regions together.

DETAILED DESCRIPTION OF THE INVENTION

0001
INDUSTRIAL FIELD OF APPLICATION
This invention relates to butt welding of clad tubes for line pipes which are laid in sour environment oil wells or the like.

0002
PRIOR ART AND PROBLEMS
Pipelines for petroleum and natural gas wells must have mechanical properties to withstand high temperatures and high pressures as well as excellent corrosion resistance. Sufficiently achieving these characteristics from a single material is difficult, so clad tubes formed from an outer layer of carbon steel or low alloy steel and an inner layer of stainless steel or high alloy steel are commonly used.

0003
Clad tubes are shipped from factories as 6 ~ 12 m long pipes, and are welded together at the oil well site to assemble a pipeline. Incidentally, when butt welding is performed, the base material is affected by the welding heat and the area around the weld region increases in temperature to approximately 800 ~ 900°C. With clad tubes, the inner layer stainless steel or high alloy steel will not transform, so the temperature rise is not a problem in particular, but the outer layer carbon steel or low alloy steel will transform into martensite if the cooling speed is rapid, and the hardness of the base material around the weld area will increase. This hardened region easily becomes brittle so normally a tempering treatment is performed at a temperature of approximately 600 ~ 690°C after welding before use.

0004
However, in order to perform a tempering treatment around the welded region of clad tubes at a construction site, specialized heat treatment equipment such as a portable heating device equipped with a heating coil must be used, and handling of this equipment is complicated and very inconvenient.

0005
PROBLEM TO BE RESOLVED BY INVENTION
The purpose of this invention is to provide a welding method for butt welding clad tubes which are used at a construction site which obviates tempering treatment after welding.

0006
MEANS TO RESOLVE PROBLEMS
In order to accomplish the above purpose, a weld cladded region of stainless steel or high alloy steel which does not transform into martensite is formed beforehand in order to prevent the outer layer of carbon steel or low alloy steel from reaching the heating temperature where temper hardening can occur (over approximately 800°C) during butt welding at a construction site. In other words, prior to butt welding at the construction site, weld cladding is performed using a weld electrode of stainless steel or high alloy steel on at least the end face of the outer layer to form a cladded region, and the base material outer layer region which was affected and hardened by the heat of welding is temper treated beforehand, and at the construction site, the stainless steel or high alloy steel cladded regions are butt welded together. Note, the thickness of the cladded region will vary depending on the outer diameter and the material thickness or the like of the clad tube, but normally if the thickness is approximately 5 ~ 10 mm, the carbon steel or low alloy steel outer layer can be prevented from reaching a heating temperature where temper hardening is possible.

0007
FUNCTION
When a stainless steel or high alloy steel cladded region is formed on the face end of the outer layer of a clad tube, the base material outer layer region which is affected and hardened by the heat of welding is softened by a tempering treatment. When butt welding lined pipe at the construction site, the stainless steel or high alloy steel cladded regions are joined together and only the cladded region reaches temperatures exceeding approximately 800°C because of the heat of welding. The carbon steel or low alloy steel region which comprises the base material outer layer does not reach over approximately 800°C, so temper hardening will not later occur because of rapid cooling.

0008
PREFERRED EMBODIMENT
When referring to Fig. 1, a clad tube is comprised of an outer layer (1) made of carbon steel or low alloy steel and an inner layer (2) made of stainless steel or high alloy steel. A cladded region (3) is created on the end faces of the clad tube using stainless steel or high alloy steel weld electrodes. Note, the end of the clad tubes are preferably tapered so that the cladded region (3) has an approximate tapered form as shown in the drawing, so that the clad tube can be used in this condition when butt welding. At the construction site for the line pipe, the cladded regions (3) (3) of both clad tubes are simply abutted and welded as usual.

0009
Next, the clad welding and butt welding of the clad tubes was performed.
• Clad tube for test (2 tubes of the following size)
Outer diameter: 175 mm, inner diameter: 133 mm, length: 2000 mm, outer layer thickness: 18

mm, inner layer thickness 3 mm

• Test clad tube material properties

Outer layer composition (C 0.12%, Si 0.17%, Mn 0.76%, P 0.007%, S 0.005%, Ni 0.46%, Cr 0.10%, Mo 0.17%, V 0.10%, remainder is essentially iron)

Inner layer composition (C 0.03 %, Si 0.32%, Mn 0.33%, P 0.009%, S 0.005%, Ni 39.8%, Cr 21.2%, Mo 3.1%, Cu 1.52%, Nb 0.96%, remainder is essentially iron)

• Clad welding

Welding method: TIG

Weld electrode composition: C 0.012%, Si 0.06%, Mn 0.06%, Ni 64.25%, Cr 21.90%, Mo 9.03%, Fe 0.71%

Weld parameters: 200 A, 25 V, 25 ~ 30 mm/minute

Cladding thickness: 5 mm in 2 layers

• Temper treatment after clad welding

Heating temperature: 600°C

Heating time: 1.5 hours

Cooling method: natural cooling in air

• Butt welding

Welding method: TIG

Weld electrode composition: same as used for clad welding

Weld parameters: First layer ~ second layer (125 A 15 V)

Third layer ~ (180 ~ 200 A, 10 V)

0010

Hardness tests were performed prior to clad welding, after clad welding, after temper treatment, and after butt welding. In the hardness tests, the area near the end of the outer layer (area affected by weld heat with conventional methods) was measured. The test method and test results are as shown below.

• Hardness test method: Vickers hardness meter, load 10 kg

• Hardness prior to clad welding: Hv 185

• Hardness after clad welding: Hv 200

• Hardness after temper treating: Hv 180

• Hardness after butt welding: Hv 180

0011

As is clear from the test results, the region around the ends of the external layer is hardened after clad welding. When temper treating is performed, the region becomes softer. However, the hardness does not change even after butt welding is performed. This shows that the effect of heat during butt welding is restricted to the weld cladded region and does not extend to the end region of the outer layer. In this manner, by means of the method of This invention, the region at the end of the outer layer will not harden after butt welding, so there is no need to perform localized temper treating of the weld region at the line pipe construction site. Note, the temper treating of the hardened region after clad welding can be easily performed using normal heat treatment facilities in the factory.

0012

EFFECT OF INVENTION

The carbon steel or low alloy steel region which comprises the base material outer layer of clad tubes for line pipes will not become hardened by the welding operation at line pipe construction sites, so there is no need for temper treating at the weld site. Therefore, the line pipe laying operation efficiency is significantly increased.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is an explanatory drawing of the clad welded region formed on the end face of a clad tube.
Fig. 2 is an explanatory drawing of clad tube butt welding.

DESCRIPTION OF FLAGS

(1) Outer layer
(2) Inner layer
(3) Cladded region

Figure 1

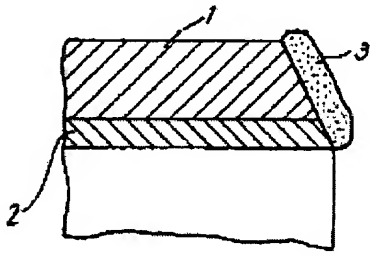


Figure 2